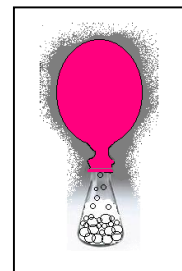


## Activity #15

### Title: Law of Conservation of Mass-Student's Copy

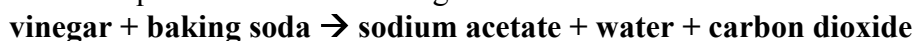


**Purpose:** To attempt to verify the Law of Conservation of Mass - *In any chemical reaction, the total mass of the reactants is always equal to the mass of the products.*

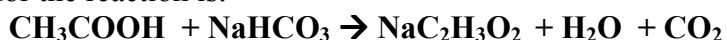
**Materials:** (per lab team) laboratory balance, weighing dish, 600 mL beaker, 1 large 12” balloon (with wide neck), 1 sheet of facial tissue (or lens cleaning paper), 3 liter soda bottle/cap (or 1.75 liter apple juice bottle/cap or any similar large-mouthed container), laboratory funnel, 250 mL flask, graduated cylinder, ~30 g baking soda, ~100 mL vinegar

**Hazards/Precautions:** Because you will be handling a weak acid, safety goggles will be worn.

**Introduction:** The word equation for the following reaction is as follows:

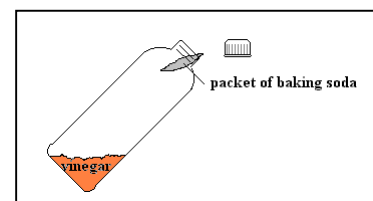


The chemical equation for the reaction is:



### Procedure:

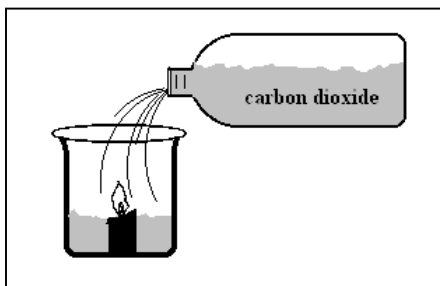
1. **(Trial #1)** Pour about 30 mL of vinegar into the beaker. Place about a tablespoon of baking soda into about a 1/3 section of the facial tissue and fold the contents into a neat little “packet.” Place the beaker/vinegar and the packet of baking soda on the pan of the laboratory balance. Measure and record the mass of these reactants/containers on the attached data chart.
2. Carefully place the packet into the beaker and allow the reaction (fizzing and bubbling) to complete. Measure and record the mass of the remaining products.
3. **(Trial #2)** Pour about 30 mL of vinegar into the 3-liter bottle using the funnel (to avoid getting the neck of the container wet). Prepare another packet of backing soda/tissue as in step # 1 above and measure and record the total mass of these reactants before mixing.
4. Tilt the bottle (as much as possible without spilling the contents), insert the packet of baking soda into its neck (being careful not to wet it) and tightly secure the cap.
5. Tip the bottle upright and allow the contents to fully react. Measure and record the mass of the container/products.
6. **(Trial #3)** Pour about 30 mL of vinegar into the 250 mL flask using the funnel to make certain the neck of the flask does not get wet. Prepare the last packet of baking soda as before and now determine and record the mass of the reactants, the flask **and the balloon** (which will be the “cover for this container.)
7. Tilt the flask (as you did the bottle in step #4) and slide the packet just into its neck, being careful not to let it slip into the vinegar. While one student holds the tilted flask tightly, another must slip the open end of the balloon over the mouth of the flask. Tip the flask upright and allow the reaction to fully complete. Measure and record the mass of the products/container/balloon.



### Inquiry/Analysis:

1. In which trials was the Law of Conservation of Mass DEMONSTRATED?
2. In which trials was the Law of Conservation of Mass VERIFIED (confirmed, proven)?

3. Why was there a difference between the mass of the reactants and the mass of the products in Trial #1?
4. Why do you suppose the mass of the products compared as they did to the mass of the reactants in Trial #2?
5. If the container in Trial #3 was covered (with the balloon), offer an explanation as to where the discrepancy (difference) arose between the mass of the reactants and the mass of the products. (Hint: Think of the helium-filled balloons you once had which were floating near the ceiling in the evening, but resting on the floor in the morning!)
6. From observing your teacher's post-lab demonstration, describe two properties (one physical and one chemical) of carbon dioxide.



7. How do you know that the carbon dioxide was denser than the surrounding air in the room?
8. How do you think the mass of the bottle (with contents) compares AFTER pouring out the  $\text{CO}_2$  as to BEFORE the pour when it was filled with carbon dioxide?

**Bonus:** Balance the chemical equation (see the Introduction) for the reactions that took place in this activity.